GAS JOURNAL, MAY 31, 1944
VOL. 243 96th YEAR No. 4228

EDITORIAL NOTES

RESEARCH REPORTS AND PAPERS

DURING the past few weeks we have been dealing in our pages with the reports and papers which in the ordinary course of events would have been published by the Gas Research Board and The Institution of Gas Engineers last November and would have come up for consideration and discussion at the autumn research meeting normally held in that month. The various research blue books for 1943 have made their appearance in 1944, and further issues of the "JOURNAL" will contain either abstracts of the reports or the papers in full, though necessarily in serial form. And before we can say knife, or blue pencil, or other appropriate expression we shall have before us the communications which were timed for presentation next month in Edinburgh at an annual meeting which, unfortunately, but rightly in the circumstances, has been cancelled. Institution blue books which speak volumes for the internal activity of the Industry loom large, and we have also had the white reports of the different I.G.E. Committees of Enquiry. There has been much to digest, and a great deal more remains on the technical menu of mixed courses prepared by accomplished chefs the majority of whom, assisted by a large band of voluntary workers, give their services for the asking.

COMPLETE GASIFICATION

TO-DAY we conclude the report of the Director of the Gas Research Board which is contained in the 4th Report of the Council of the Board. Dr. King has usefully summarized in the form of a review the progress of the various active research investigations of the Board up to last October, and has included short statements on other researches of direct interest. The review set out in brief the facts concerning what the Board has accomplished and is doing. Though it calls for little comment, it is, we think, indicative of much promise; obviously the work has been and is being undertaken with the right scientific approach and tackled in serious vein and penetrating manner. Small in number, the research staff is undoubtedly a highly-skilled team which through continuity has acquired invaluable experience. It is a team which should provide the best possible nucleus for the expansion of the organization of the Board to a size appropriate to the Industry's scope—a scope which to us seems ever-widening. The nutshell story of the Research Director is there for everyone to read. Perhaps first thoughts will be towards complete gasification, and to our mind Dr. King's condensed remarks on this subject lend an air of sobriety and reality to the problem—a sense of realism which it is perhaps desirable to accentuate. When we talk of complete gasification of coal in hydrogen under pressure it is, we suggest, salutary to bear in mind that the original reaction vessel was a 1-in. diameter tube. Subsequent experiments were made with a 4-in. diameter tube, later increased to 6.5 in., when disturbing factors made their presence felt.

At this juncture in the work observations on the action of hydrogen on coals altered the course of the research. Systems were considered for processes involving more than one stage, but with the action of hydrogen as one stage. To overcome difficulties in the control of caking and in the utilization of the heat of reaction, several alternative schemes have been envisaged. So far, ideas on them have been protected by nine patents; a further patent is pending. The next step, which brings us to the present state of the investigation, was to design a larger apparatus. This has been designed and should soon be completed. The charge of coal with the 4-in. tube was 2.2 lb. The reaction vessel of the semi-scale plant about to be completed is 14 in. in diameter. It will deal with a charge of coal of about 300 lb.—a useful figure to have in mind when discussing complete gasification. We come to possibilities. The process, as stated by Dr. King in his review, may be combined with others—for example, with one involving the production of hydrogen by the pressure gasification of coke, or part of it, with oxygen and steam in a Lurgi generator, or with a process of methane synthesis from gaseous mixtures containing hydrogen and carbon monoxide, or with a process involving the sale of the reactive coke and the production of the necessary hydrogen by the breakdown of part of the rich gas made. These remain for exploration. The immediate problem is to gasify coal with hydrogen under pressure on the 300 lb. scale—a cogent point lending a sense of proportion and balance when contemplating plans for development of the Gas Industry in the early post-war years.

We take it, then, that, far from complete gasification with hydrogen under pressure being a *fait accompli* in any practical sense, research on complete gasification is just getting under way after several years of excellent work devoted to the problem by first-class investigators in the laboratory. That this investigation and other collateral researches—*e.g.*, the synthesis of methane—are being developed progressively is patently to the good. We simply cannot afford not to carry out such development work, and it ought to be more vigorously extended. It is not a matter for congratulation that the undertakings which are members of the G.R.B. represent 78% of the gas made in the country. Nor should the establishment of adequate accommodation for the Director and his headquarters staff be allowed to remain merely a floating desirability. Admittedly the Council of the Board in this, its fourth, report (in which mention is made of the "dignity" of the Industry) states its intention to set up an establishment in the neighbourhood of London, but its pious aspirations in this respect would appear to verge on the nebulous. Or is it that the Board has plans but considers it unwise to disclose them in the present exigency? In the meantime most of the work is being carried out in the restricted laboratory space available at Leeds University—*vide* the photographs we published in our issue of March 8 last.

SOLID SMOKELESS FUEL

WE have given the impression on the present position of the complete gasification process we have gained from the latest report of the G.R.B., which apart from passing reference to coke for producer-gas driven vehicles, leaves the question of coke severely alone; and we will now turn for a moment to other white and blue communications. On a later page of this issue of the "JOURNAL" will be found the Report (Part 2) of the I.G.E. Committee of Enquiry on Coke Quality. On account of its brevity, its publication in full has occasioned us no difficulty. The document, drawn up on the assumption—or, rather, the considered opinion—that for some time to come the policy of the Gas Industry will be to develop as a two-fuel Industry, is a model of simplicity. Following the most concise of reviews the Committee concludes that the immediate short-term policy of the Gas Industry should be the installation of special coke-burning appliances to burn gas coke both in post-war houses and in replacement of a proportion of existing open coal grates; and that there is clearly need for further improvement in the quality and preparation of gas coke and the design of coke-burning appliances. The recommendations made are again the reverse of complicated. They are that the National Federation of Gas Coke Associations be asked to develop its present policy regarding the improvement of coke; that the appliance makers be encouraged to improve the design of special

coke-burning appliances; that the Gas Research Board be requested to undertake any necessary research and investigation into the problem of marketing better cokes, including activated cokes; and that everybody—gas coke producers, the coke oven industry, the G.R.B.—should work together to this end. All of which, considering the importance of the Gas Industry's solid smokeless fuel market, seems eminently reasonable, and boils down to the need for quickened appreciation and bolder and more definite action.

In our view it was very appropriate that for the ghost autumn research meeting which, as it were, has walked noiselessly into the late spring of a following year, there should have been prepared two communications dealing with the production of coke for the market. To-day we conclude the Paper by Mr. Gill on the manufacture of free-burning coke in gas-works at normal carbonizing temperatures, in which he described the results of experiments on the blending of coking and non-coking coals based on proposals originally made by Mr. John Roberts. War conditions rendered it impracticable to carry on with the process, but over a number of years valuable experience was gained, and we think the results set out by the Author are wholly encouraging from the dual point of view of consumer and gas undertaking. Certainly the data set out will prove useful and, we suggest, invite far more than passing interest by the Gas Industry. They invite attention, too, from the coal industry, whose Research Association might well take note of Mr. Gill's terse comment that the collieries supplying the non-coking coals showed no interest whatever in this new use of their coal.

We have given Mr. Gill's communication in full. Then there was the I.G.E. Paper by Mr. Tomlinson dealing with coke grading. This we also intend to publish *in extenso*. Obviously the handling of coke, its screening and grading, costs money, though, to cope with present and future market demands, such handling should be regarded as a *sine qua non*, and the expense entailed should be adequately covered by an enhanced sales value of the product. Equally obviously the financial return will be influenced directly by the amount of breaking-down into less remunerative sizes which occurs during this handling. Every effort should be made to avoid degradation by breakage and abrasion in handling and grading; everything possible should be done to increase the value of the finished product—*e.g.*, by the removal of dust and by correct and accurate grading. Towards this object Mr. Tomlinson's Paper—essentially a practical analysis—should prove of real help. And we agree with and would emphasize his over-riding contention that it is a matter of enlightened policy from every angle to spend money *judiciously* on suitable coke-handling plant and on its proper technical supervision, coupled with adequate maintenance. The contribution was a pointer to what constitutes judicious expenditure in this direction.

Personal

Mr. G. J. PILBEAM, Sales Manager, Mr. A. DEWEY, Buyer, and Mr. E. PALMER, Secretary and Accountant, have been appointed Directors of Walworth, Ltd. All three have been in the service of the Company for a number of years.

In a Recent "Salute the Soldier" Campaign, a Company of the Home Guard from Pembroke and Pembroke Dock raised over £1,600. The Officer Commanding the local Home Guard is Major Darrell Rees, Engineer and Manager of the Pembroke District Gas Company.

In View of the Government's recent recommendation with reference to conferences, the Committee of the Eastern Counties Gas Engineers' and Managers' Association decided, with regret, to cancel the Annual Meeting and Luncheon scheduled to take place to-day, May 31.

The Cherchefelle Savings Group is run by the Head Office staff of the East Surrey Gas Company. Its savings have recently averaged £29 weekly. For the Reigate, Redhill, and District "Salute the Soldier" Week the Group set itself a target of £500. It secured a total of £1,269, thus demonstrating that special national savings campaigns do attract small savings. The area target was £500,000, but £651,138 was realized. Of this, £167,341 comprised small savings, which represents £4 1s. 6d. per head in a population of 41,000.

Letters to the Editor

The Question of Salaries

DEAR SIR,—We were glad to read Colonel Croft's remarks at the Annual General Meeting of the London and Southern District Junior Gas Association on the subject of salaries, some of which, offered in "Appointments Vacant" advertisements, he characterized as "scandalous." This is a subject which has been commented on in the plainest language time and again, but it appears that a large proportion of the Gas Industry, Bourbon-like in learning nothing and forgetting nothing, is determined to pursue the same suicidal policy, and to refuse to encourage the suitable executives who are so essential to its future prosperity.

Appointments vacant advertisements for the two weeks ended May 6 and May 13 furnish particularly strong evidence of this assertion. Within that period twelve undertakings, all but two of which are municipally owned, offer situations which with two exceptions (£400 and £405) fall within a basic salary range of £250 to £360. Three of these undertakings are of an approximate capacity of 1,000 million cu.ft. per year and three considerably over. The jobs and remuneration in the case of the first three are technical assistant £300, chief technical assistant £360, and assistant chemist £275; and for the other three, carbonizing superintendent £360/405, works manager £320, and assistant works chemist £250. Other positions were engineer and manager of two small works at £310 and £286 respectively, and deputy engineer and manager of a medium-sized works £400.

This is indeed a deplorable commentary on the Industry's efforts to attract the right type of entrant, and stands in the relation of cause and effect to the recent caustic comments of the I.G.E. examiners.

In the electrical industry the E.P.E.A. is the recognized authority for dealing with matters affecting the status and minimum salary scale of its technical staff, and we feel strongly that The Institution of Gas Engineers should be the corresponding medium for those in the Gas Industry.

As long as we think meanly of ourselves, others will take us at our own valuation.

Yours faithfully,

May 23, 1944. AN ENGINEER AND A CHEMIST.

P.S.—We should like to add that we have no axe to grind, as we work for a Company well known for its fair treatment of its staff.

Gas Industry Literature

DEAR SIR,—Mr. T. A. Tomlinson's article, printed in your issue of March 1, is of the greatest import and interest. Too frequently one is told our Industry is decadent, yet, as Mr. Tomlinson so ably points out, we are having the greatest difficulty in keeping up to date the printed form of our technology. This is true of all the world, and not only of Great Britain.

As pointed out by Mr. Tomlinson, the American Gas Industry has recognized that the writing of technical books is hardly a task for one man writing one book, but rather the writings of several books, under the guidance of an advisory committee, by sub-committees working with one expert well versed in his subject. This is the system used in the writing of two recent American books known as "Chapters," and it will be followed in the writing of at least seven more future "Chapters." The work is done under the auspices of the Chemical Committee of the Technical Section of the American Gas Association. It is possible some future "Chapters" may come under some A.G.A. Section other than the Technical Section. In your case they might be sponsored by some organization other than The Institution of Gas Engineers.

Mr. Tomlinson's suggestion of an Editor-in-Chief to attain homogeneity of style is sound. Also to be considered is the format which in the American books, by agreement, takes that of the American Society of Testing Materials.

As it is not possible to sell such books at a profit, the writing cannot be anything but a "labour of love" and inevitably in the "team spirit," well backed up by employers of the authors and committees concerned.

It always will be difficult to decide just what technical matter to include and omit in such books. Information of importance, but not included in the books, should be made available to the Industry by means of reprinting in full in the Technical Press, or at least of extracts or bibliographies for reference. Many feel there is too much valuable data buried in the files of parent and other associations which may never again see the light of day.

The A.G.A. Technical Section books, written and being written, are sold at bare cost, without profit, of $3.50 per "Chapter" to members of the A.G.A. and $5.00 to non-members. For the duration of the war at least, the cost to British gas men is the lower figure of $3.50, which is a small but true indication of the wish to disseminate technical information as freely and inexpensively as possible, not only in the U.S.A., but also abroad. It is possible the price of later "Chapters" may not be the same.

Last February, Mr. F. J. Pfluke, Chairman of the Gas Production Committee of the Technical Section of the A.G.A., circularized its members, suggesting each send him a list of the technical periodicals and bulletins he reads. These are to be tabulated at headquarters and each person will then be assigned certain ones. When he sees, although he may not actually read, an article he thinks will be of

interest to the members of the Technical Section, he merely writes the title and reference on a card supplied by A.G.A. for the purpose. Each month these cards will be tabulated together with those prepared by the A.G.A. Librarian from publications assigned to him, and then printed in the American Gas Association Monthly Magazine. This idea is new and is expected to start soon. Technical men will be glad to receive this additional help in keeping them up to date on new developments.

There seems to be need for new books to be written for the benefit of young or new men entering the Industry, both in the U.S.A. and in Great Britain. For them class-books are too elementary, and yet the proposed standard works are too advanced. More and more men entering the Industry to-day are technically trained. We should give them a sound but reasonably gentle introduction to our technical problems rather than confuse them abruptly with our new standard works. We must encourage new and young blood to flow through the veins of our Industry, which, far from being decadent, will come more and more into its rightful place in the scheme of things to come. Only if we give them a good start and encourage them to put their best foot forward will they feel they have our complete confidence. Technical books they can understand and absorb will be at least one indication we are out to help them.

Mr. Tomlinson has asked me if I thought "that by collaboration between Great Britain and the U.S.A. an 'English-speaking' Data book could be produced?" The idea is most intriguing and I presented it to Mr. Ernest R. Acker, President of the American Gas Association. He discussed the subject with Major Alexander Forward, Managing Director of the A.G.A. They feel a "Data Book" would be very worthwhile, but under current pressure of war suggest postponement till after hostilities cease. To quote Mr. Acker, "At that time we will be very glad to discuss the matter further and to arrange for the necessary collaboration of the American Gas Industry."

No doubt such work would be accomplished by means of joint committees of the Technical Section of the A.G.A. and appropriate organizations of the British Gas Industry as then set up. Much of the work would be done by correspondence and, we hope, by visiting technical men when travel is again permissible. Appropriate liaison would need to be arranged with other English-speaking countries. It is also possible a paid Editor would be helpful after preliminary work was under way, as the A.G.A. has already done in several instances.

Even though the American Gas Industry, through the American Gas Association, has revised its text-books from time to time, there is no smug feeling that available technical information is complete or adequate. Much thought is still being given as to how technical data can be best and most satisfactorily disseminated among those who desire and those who need to be informed.

I trust the foregoing remarks will be of some interest, if only to indicate that the problem is not merely national but international in scope.

424, *Madison Avenue*,
New York 17.
April 27, 1944.

Yours faithfully,
S. J. BEALE,
General Manager, West Gas Improvement Company of America, Inc.

Gas and the Weather

DEAR SIR,—I note with pleasure that you are interested in the work now being done by the National Joint Committee on Weather Statistics to standardize methods in use regarding the "Degree-Day."

In addition to the organizations which you mention in your issue of Dec. 15, 1943, p. 742, the National Coal Association and the National District Heating Association are members of the Committee. There are possibly fifteen additional organizations interested to a lesser degree that we hope to have endorse our standard methods when they are more nearly completed.

The Committee, in agreement with the United States Weather Bureau, will show a standard method of setting up maximum or minimum thermometers, a standard method of reading and recording temperatures, and a standard way of computing both actual daily and normal daily degree-days from the figures. We hope to have within the next year normal degree-day figures for several thousand weather stations in the United States, all figured on the same basis.

National District Heating Association,
827, *N. Euclid Avenue*,
Pittsburgh 6, *Penna.*
April 18, 1944.

Yours faithfully,
JOHN F. COLLINS, Jr.,
Chairman, National Joint Committee on Weather Statistics.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Institute of Physics

The Annual Report of the Institute of Physics, which has just been issued, once again reflects the important contributions to victory which are being made by British physicists, and records plans which are now being made so that this young profession can continue its vital service for the development of our industries when hostilities cease. In particular, the Board of the Institute has given consideration to the position of physicists and those desiring to enter the profession during the demobilization period. It is in touch with the Government on these matters, and through the Joint Council of Professional Scientists is co-operating with qualified scientists practising in other branches of science such as chemistry, biology, and geology.

The Institute's report on the Education and Training of Physicists was, it is stated, well received both at home and overseas. Active steps have been taken to follow up the recommendations contained in it. The enquiry into "the possibility of including the various branches of technical physics within the framework of National Certificates and Diplomas" has made good progress.

Illuminating Engineering Society

The Annual Meeting of the Illuminating Engineering Society was held at the Institution of Mechanical Engineers on May 9. The report for the past year was summarized by the President (Dr. H. Buckley), who drew attention to the formation of centres in Bath and Bristol, and Groups in Derby, Huddersfield, and Stockton-on-Tees. The report explained the new method of organization into seven distinct areas, each with its own Committee, which in turn is represented on the Areas Joint Committee. No fewer than 243 new members have been added to the list during the past year. The number of meetings held, upwards of 60, exceeds that in pre-war days.

Recent educational efforts include the organization of essay competitions for pupils in schools near Birmingham, and the giving of a series of Christmas lectures on "The Wonders of Lighting" to over 1,000 children in Bradford. The Society has been instrumental in forming a Joint Committee, with which leading physiologists are associated, to deal with the Physiology of Vision, and has completed, for the Ministry of War Transport, a special investigation into the Brightness and Legibility of Traffic Signs.

In the course of the meeting it was reported that Officers and Members of Council for the forthcoming session would be as follows:

President.—E. Stroud.
Vice-Presidents.—H. C. Weston, Dean Chandler, and Howard Long.
Hon. Treasurer.—N. V. Everton.
Hon. Secretary.—J. S. Dow.
Members of Council.—P. V. Burnett, W. J. G. Davey, W. Hetherington, R. Maxted, C. W. M. Phillips, George Smith, J. M. Waldram, and G. T. Winch.

Emergency Factory-Made House

Since the erection of the first prototype of the emergency factory-made house, the following modifications and improvements have already been made by the Minister of Works in consultation with the Minister of Health:

1. Back door leading into the kitchen.
2. Ceiling height to be raised to 7 ft. 6 in.
3. Cycle and store shed to be detached.
4. Passage door into kitchen to be abolished. Kitchen unit to be extended and combined with the stove, thus providing improved hot-water circulation. Hot cupboard to be transferred to unit and to be of larger area. The vegetable cupboard to be moved away from the cooker.
5. Bathroom to be increased in area.
6. W.C. to be made larger and adequately screened.
7. Area of hall to be increased, providing larger space for pram, &c.
8. Direct entrance to be provided from hall to living room.

For the assistance of those unable to see the house itself at Westminster, a complete set of drawings and photographs is now on exhibition at the Building Centre, Maddox Street, W. 1.

At the Annual Meeting of the Ayr Gas Company, Ltd., a dividend of 6½% was declared, less tax. Expenditure was £2,700 up at £28,059, and income £1,665 up at £34,822, profit being £1,032 less at £5,517.

The First Report of the Standardization Committee of the Ministry of Works which has just been published indicates the progress that has been made in this work, which aims at securing efficiency and economy in building. The Committee, which is composed of representatives of the various interests most affected, under the Chairmanship of Mr. Sydney Tatchell, F.R.I.B.A., has made recommendations in no less than one hundred cases. These recommendations have, in accordance with the procedure adopted, now been passed to the British Standards Institution for the formulation of the Standard Specifications. The Report, which includes a suggested standard for gas flue blocks, is published by H.M. Stationery Office under the title of "The Use of Standards in Building" (price 6d.).

Wales and Monmouthshire Association

For the first time in the history of the Association, Pontypridd was the venue for the Annual Meeting of the Wales and Monmouthshire Association of Gas Engineers and Managers, held on May 18. This meeting was of particular importance because the rules of the Association were revised so as to provide for the formation of North Wales and South Wales sections, resulting in the fusion of the Wales and Monmouthshire Association of Gas Engineers and Managers and the North Wales Gas Association.

Mr. David Muir (President) supported by Mr. E. P. James, J.P. (Chairman of the Pontypridd U.D.C.), in welcoming members, expressed especial pleasure in the attendance of members from North Wales; he welcomed this move of integration, creating as it did one body representative of Wales.

The following new members and associates were elected: *Members:* Messrs. H. Hill (Llanelly) and D. T. Phillips (Mountain Ash). *Associates:* Messrs. R. W. Crowther (Retford), G. T. Townley (Mansfield), M. Summerville (Llantrisant), and A. W. White (Cardiff).

Presenting the 39th Annual Report and Statement of Accounts, Mr. E. M. Edwards stated that the membership now comprised 165, consisting of 91 members, 65 associates, 6 honorary members, and 3 student members. Mr. Edwards referred particularly to the work of the Gas Engineering Advisory Board and to the increasing importance of the work it was called upon to perform. The Report and Statement of Accounts were adopted.

Mr. J. H. Canning (Newport), giving his report on the Octavius Thomas Memorial Fund, stated that during the year £300 of 2½% Consols had been handed over to the Benevolent Fund of The Institution of Gas Engineers, as decided at the September, 1943, meeting of the Association. The interest from this amount was to be placed, each year, to the credit of the current Revenue Account of the Benevolent Fund.

In recognition of his invaluable services to the Association—of which he was a founder member—honorary membership was conferred on Mr. D. Walter Davies, who, on June 30, is retiring on superannuation after 40 years' service as Engineer and Manager of the Tredegar Gas Department. In a happy response, Mr. Davies traced the founding of the Association and the reasons that gave it birth; the honour, though unexpected, was treasured, and was one which he hoped long to enjoy.

Responding to the welcome accorded by the President, Mr. O. P. Cronshaw, Chairman of the North Wales Gas Association, expressed pleasure that a move had been made which would result in the future co-ordination of work; he looked forward to the time when members would visit North Wales, where they would be assured of every welcome. Mr. W. J. Mulley, Secretary of the Association, referring particularly to post-war problems, emphasized that the need for a united association had been appreciated from the outset; he was gratified that this had now come into effect.

Election of Officers.

Mr. W. T. Kenshole (Merthyr) was elected President for the ensuing year. This election served to remind members of the work performed for the Association by his father (a founder member), and indeed for the Gas Industry in general. They were sure that Mr. Kenshole would fully maintain the family tradition.

Responding, Mr. Kenshole thanked the members for their kind expressions. He assured them that he would do his utmost on behalf of the Association.

Mr. E. M. Edwards (Port Talbot) was elected Senior Vice-President, with Mr. B. J. Bell (Cardiff) Junior Vice-President.

Mr. E. M. Edwards was also re-elected Hon. Secretary, with Mr. Darrell W. Rees, M.B.E. (Pembroke Dock), Assistant Hon. Secretary.

The meeting confirmed the Council's decision to subscribe to the Benevolent Fund of The Institution of Gas Engineers. Addressing members on the value of this Fund, Mr. J. F. Rust (Newport) expressed the hope not only that subscribers would increase their contributions, but also that there might be an increase in the number of contributory members. He made a special appeal for the completion of a Deed of Covenant.

Mr. David Muir then gave his Presidential Address, which will be dealt with subsequently in the "JOURNAL."

At the luncheon which followed the morning session, "The Town and Prosperity of Pontypridd" was proposed by Mr. J. H. Canning, O.B.E. (Newport).

Replying to the toast, Mr. E. P. James, J.P., Chairman of the Council, gave instances of some of the difficulties which the town had had to face and which he was pleased to say had been overcome. As the town had grown and prospered so had the Gas Department, under the wise guidance of their Engineer and Manager, Mr. David Muir, whom he was pleased to see occupying the honoured position of President of the Association.

Mr. Arthur Pearson, M.P. for Pontypridd, urged members to be ready to make their own contribution to the reconstruction which was bound to come. He advised full attention be given to scientific research, and he recommended them to make known to the Gas and Electricity Section of the Ministry of Fuel and Power—through their individual M.P.'s, through the Welsh Parliamentary Party, and through the Parliamentary and Scientific Committee—any specific proposals which they considered would be of advantage to the Industry and to the public it served.

Professor T. D. Jones, Chairman of the South Wales Section of the Institute of Fuel, proposed "The Wales and Monmouthshire Association of Gas Engineers and Managers." He also made an appeal for greater research, which he contended was the life-blood of scientific development. He congratulated Mr. Muir on being President of the Association, which had a long and excellent record of achievements; he felt that the future had in store ample opportunities for further valuable contributions to the benefit of the Gas Industry.

During the afternoon session a Paper entitled "Benzole Recovery at Cardiff" was given by Mr. L. L. Kleist, Chemist, Cardiff Gas Light and Coke Company. [This will also be dealt with in a subsequent issue of the "JOURNAL."]

Following a good discussion, a vote of thanks to Mr. Kleist was carried with acclamation.

Diary

June 5.—Association of Gas Corporations: General Purposes Committee, 2.30 p.m.; Council, 3.30 p.m., Gas Industry House.

June 5.—B.C.G.A. Executive Committee: Gas Industry House, 2 p.m.

June 6.—Gas Research Board: Finance Committee, 11.15 a.m.; Membership Committee, 12 noon; Annual General Meeting, 2 p.m.; Council, 2.30 p.m., Gas Industry House.

June 7.—Solid Smokeless Fuels Federation: Technical Committee, Gas Industry House, 10.30 a.m.

June 13.—National Federation of Gas Coke Associations: General Committee, Gas Industry House, 10 a.m.

June 16.—Gas Research Board: Joint Research Committee, at Leeds or Bournemouth.

June 19.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Gas Industry House.

There will be no meeting of the N.G.C. Central Executive Board in June.

The United Kingdom Gas Corporation, Ltd., has declared a final dividend on the Ordinary Shares of 3%, making 5% for 1943.

Airdrie Gas Committee has proposed to the Town Council that, in all future housing schemes, a gas poker be installed in each municipal house as a standard part of the gas fittings. The proposal has been approved by the Town Council Committee, and awaits ratification by the Council as a whole.

Plymouth and Stonehouse Gas Light and Coke Company.—Final dividends are recommended at £2 17s. 6d.% on Ordinary stock, making £4 17s. 6d.% for the year (the same as for the previous year), 8s. 6d. per share on Additional shares, making 14s. 6d. for the year (same), and 8s. per share on New shares, making 13s. 6d. for the year (same), all less income tax.

The Limitation of Supplies (Heating Apparatus) (No. 4) Order, 1944 (S.R. & O., 1944, 591), which covers the restriction period June 1 to Nov. 30, 1944, now on sale (H.M. Stationery Office, 2d.); makes no changes in the control on supplies of gas and electrical space-heating apparatus of a kind used for domestic purposes, the quota remaining at 15%. The Heating Apparatus Trades Register will not be revised during this restriction period, and those who were on the register on Jan. 1, 1944, are to be regarded as registered persons for the purpose of computing the value of sales during the standard period June 1 to Nov. 30, 1939.

Presiding at the Annual Meeting of Associated Gas and Water Undertakings, Ltd., at Reigate on May 25, Mr. W. H. Bennett said it was difficult to understand that useful purpose was now served by the embargo on the publication of public utility accounts, which illustrated the ease with which controls were applied and the difficulty of securing their removal. The results achieved by the Company were particularly gratifying having regard to the extreme difficulties under which gas undertakings worked. Referring to the Report on the Planning of the Gas Industry, Mr. Bennett said they had acquired considerable and unique experience of the problems involved in the geographical and functional integration of the Industry. Practically all their undertakings now operated in two geographical groups, manufacturing units had been interconnected, and the management of subsidiaries had been co-ordinated. Technical, commercial, and administrative supervision and services had been afforded them, and their adequate finance on advantageous terms had been secured. The war had necessarily retarded such development, but with the cessation of hostilities their activities, which were now being planned, would be resumed in intensified form.

Work of the Gas Research Board*

Report of the Director

(*Concluded from p. 661*)

In addition there is a noteworthy advantage in the increased pressure which would be imparted to coal gas before admitting it to liquefaction plant, namely, the high efficiency at which washing processes would operate, as, for example, the scrubbing out of ammonia by water, or of H_2S by a suitable solvent. After passing through the plant the gas could be maintained at pressure for long-distance transmission or expanded to obtain the refrigeratory effect and the recovery of some of the work of compression. Preliminary calculations on the design of a suitable expansion turbine have already been made.

These points and others are being borne in mind in the preparation of alternative plant lay-outs, and it is intended eventually to consider a detailed account of each, with an estimate of capital and running costs.

The work on methane synthesis is particularly interesting in association with the liquefaction process, since the synthesis gas would be of higher methane content (about 65%). The higher the percentage of methane the more economical is the liquefaction process. This aspect is also being considered.

While this work is going on, a systematic study is being made of the phase equilibria attained by typical coal gases, when subjected to varying degrees of refrigeration over a wide range of pressures. Research on heat transfer at low temperatures will shortly be commenced. Both these researches are directed towards obtaining data for the design of plant for liquefaction and separation.

Heating and Drying by Radiation

Radiant heating (or infra-red) processes have become of considerable industrial importance during recent years, as for example in the drying of paints, and they may well find rapid and extensive application to other heating and drying operations in the near future.

The Council became directly interested in the subject in 1940 as a result of certain work on luminescence carried out by the Arthur Duckham Research Fellow. At the same time the Yorkshire Industrial Gas Centre decided to investigate heating by radiation and arrangements were made for collaboration through Professor Townend. A suitable infra-red spectrometer was obtained, and the Arthur Duckham Fellow was appointed research physicist to carry out work of a fundamental character. One short paper on the application of radiant heating in the glass industry has already been published.†

The objects of the research work carried out on infra-red radiation during the year 1942–43 have been, in general, to establish the fundamental principles underlying radiant heating processes and, in particular, to examine how gas-heated appliances may best be utilized for this purpose. Special importance attaches to the question of whether a radiating source operating at a medium temperature and having characteristics approaching those of a "black body," as in the gas-heated panel radiator, is preferable in general to higher temperature sources—*e.g.*, heating refractory materials by flame, as in the gas fire—which do not radiate fully over the complete infra-red wavelength range but exhibit "selective" characteristics, the bulk of the emission being confined to relatively narrow bands of wave-lengths. These problems, among others, are now being studied with the aid of the infra-red spectrometer.

The technique of intra-red spectrometry is difficult, and a considerable time has necessarily had to be spent in establishing suitable methods, and in improving the standard instruments to meet the special needs of the work. The original apparatus included a galvanometer of the moving magnet type; this possessed the essential high sensitivity, but was extremely susceptible to vibration and stray magnetic fields, so much so that successful results could only be obtained by working during night-time. In view of this limitation the possibility of using moving-coil galvanometers has been examined; these instruments are robust and almost free from disturbing influences. No single instrument proved sufficiently sensitive for the programme of work planned, however, but a successful system was eventually devised using two such galvanometers, coupled by means of a photoelectric cell. The beam of light from one of the galvanometers which receives impulses from the spectrometer thermopile is focused on to the photoelectric cell, the resulting current from which is fed to the second galvanometer. This system has given ample sensitivity and is free from serious disturbing influences.

Good progress has been made with the study of the emission characteristics of refractory materials over a range of temperatures and heated electrically or by gas. Results obtained with alumina show that the emission is selective in character and falls far short of that of a black body at the same temperature; both the nature of the emitted radiation and its intensity may, however, be considerably modified by the presence of small amounts of additives, such as Fe_2O_3 and Cr_2O_3. The work is now being extended to cover all representative refractory materials which are likely to be used in gas-heated sources of infra-red radiation. The full programme covers a comprehensive investigation into the most suitable sources of emission for any particular process and an examination of the likely improvement in efficiency of the process compared with present practice.

During the year the Gas Light and Coke Company has developed at Watson House an experimental apparatus* for heating by radiation and has demonstrated very satisfactory efficiencies in the drying of paint films on metal objects. The apparatus is being applied to examine the efficiency of radiant heating in the processing of other materials, including ceramics and pottery.

Work of the Research Fellows of The Institution of Gas Engineers†

The problem of combustion characteristics arises from the number of variable factors concerned with gas supplies throughout the country, in particular the variations in calorific value, chemical composition and attendant air requirement, gas pressure and specific gravity. All such factors make it difficult to predict the precise behaviour of an appliance on a particular supply. Probably the most important factor is the variation of chemical composition. Efforts are being made to provide some means of over-all assessment of these characteristics, special mention attaching to the work of the Joint Research Committee and at Watson House (Gas Light and Coke Company) with the Aeration Test Burner, and also to the work of the South Metropolitan Gas Company on the graphical portrayal of the zones of stability within which any burner must function.

There has been a great need for more fundamental knowledge on such matters as the variation of ignition velocity with chemical composition of a supply and the actual physical characteristics of the phenomena of light-back and blow-off. An investigation has been made into the methods of measuring ignition velocity, which has led to its establishment as a physical constant, independent of all environmental factors except the working temperature and pressure. This result has been rendered possible by the careful measurement of inner cone areas, previous workers having calculated them on the assumption that they approximate to true cones. This work has also led to an appreciation of the importance of the dead space between the head of the burner and the base of the flame in relation to both light-back and blow-off. Further, the view has been put forward that the limiting diameter for light-back can be employed as a criterion of the light-back susceptibility of any supply. This will be put to practical test as soon as opportunity avails.

The technique of shadow photography has been employed recently in order to ascertain how far the phenomena concerned are influenced by aerodynamic factors; in particular, new light has been thrown on the characteristics of gas flow from the burner head before ignition.

The view outlined relative to the importance of dead space, as well as its interpretation as a requisite thermal gradient ahead of the flame, has been endorsed by the American investigators, B. Lewis and G. von Elbe.

Research on Refractories

The following is a summary of the work done for the Gas Research Board during the period 1942–43 by the British Refractories Research Association:

Refractory Insulating Materials

A study has been made of the burning-out of a considerable range of combustible materials which are or could be used to develop porosity in clay refractories. Little difference in the ignition temperature was noted, nor was the porosity appreciably different when related to the volume of the combustible matter present in the unfired specimen. The type of combustible matter used, however, affected the cold crushing strength of the fired product.

The effect of the pressure of overlying courses in causing deformation of insulating firebricks during firing has been examined experimentally, and it is concluded that squatting may be reduced by curtailing the period of soaking at the maximum temperature. The amount of deformation which can be tolerated must be weighed against the probable re-heat shrinkage.

Using the dry-press method for making grogged-clay insulating bricks, sample bricks of low bulk density coupled with adequate strength, spalling resistance and high-temperature stability have been made. The porous grog for these bricks was obtained by firing finely ground fireclay and — 16 mesh anthracite.

Modern methods of manufacturing refractory insulating bricks have been reviewed.

* From G.R.B. Publication No. 8.

† Smith, E. C. W., Roberts, A. L., Townend, D. T. A., *J. Soc. Glass Tech.*, 1942, 26, 113.

* Andrew, L. W., and Chamberlain, E. A. C., *Inst. Fuel* (*War-Time Bull.*), Oct., 1943, p. 41.

† Report, 1942-43, "A Study of Aerated Burner Flames," III and IV, *Inst. Gas Eng. Comm.* No. 255 (1943).

Interim Report, 1941; "The Stability of Aerated Burner Flames, I and II," *Inst. Gas Eng. Comm.* No. 245 (1941).

Report, 1939-40; "A Study of Aerated Burner Flames, I and II," *Inst. Gas Eng. Comm.* No. 244 (1941).

GAS WORKS PLANT

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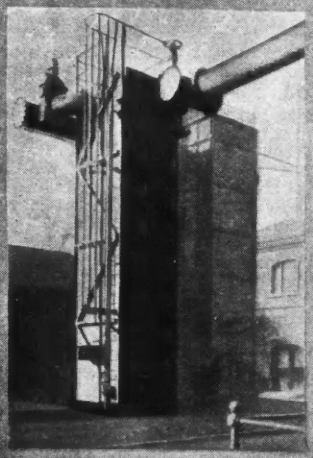
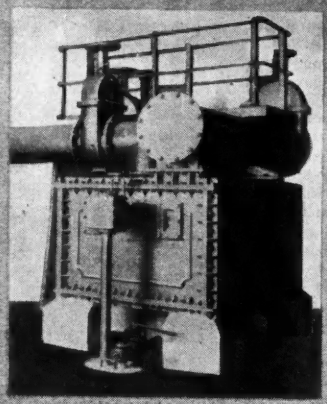
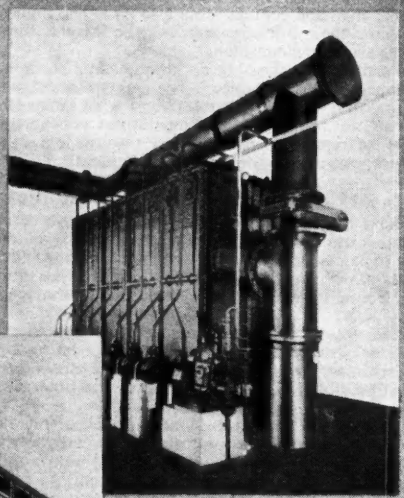
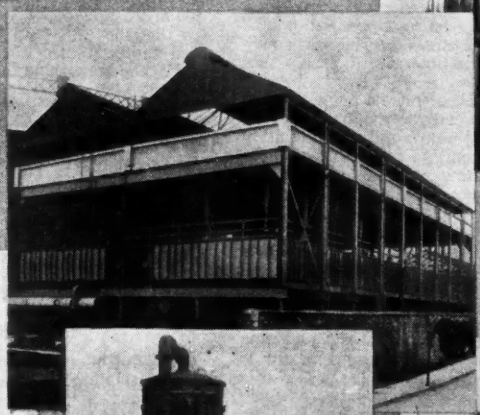
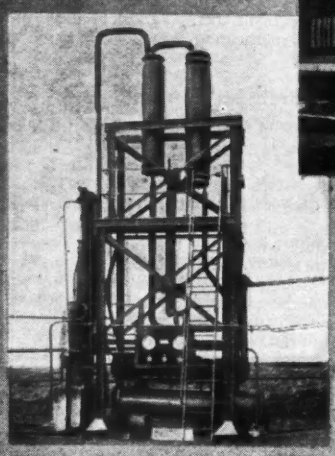
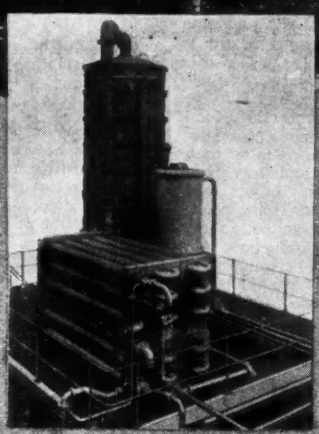
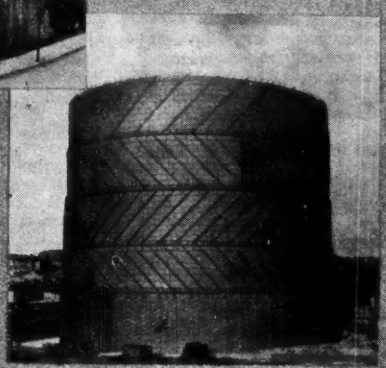

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Work on the subject of refractory coating for insulating bricks has been continued, but whereas previous work was concerned with fired coatings, the present experiments have covered the spalling behaviour of unfired coatings. Some progress has been made in developing a chrome ore coating which is adherent and resistant to spalling.

Spalling

Under the title of "A Panel Spalling Test" a description has been given* of equipment and procedure for assessing the resistance of refractory materials to spalling. In service, spalling may be attributed to stresses arising from alternations of temperature in the refractories, and may become aggravated when the hot face, through exposure to working conditions, becomes differentiated in texture and constitution from the body of the brickwork. It is not surprising, therefore, that the simpler tests, involving the heating and cooling of small test-pieces or even whole bricks, fail to show satisfactory correlation with data based on performance in service. There is good reason to believe that a test in which a number of bricks laid up with jointing cement in the form of a panel and first heated to simulate the action of continued working and then subjected to cycles of heating and cooling, will provide a sound basis on which to judge spalling resistance.

Spalling data have been obtained in nineteen brands of silica bricks and two siliceous products. Other properties of these bricks have been studied, including the reversible expansion, the modulus of elasticity, after expansion, permeability, apparent porosity, true specific gravity and bulk density. The quartz content, as determined by examination in thin section under the microscope, has also been estimated. A correlation of the properties is being attempted.

* 34th Report of the Refractory Materials Joint Committee, *Comm.* No. GRB 9 (1943).

Deformation of Refractory Materials at High Temperatures

Little has been reported hitherto on the relationship between load and rate of deformation at high temperatures. The rate of deformation under compression stress of three types of fireclay fired at 1,400°C. and in some instances at 1,500°C. has been measured at 1,250°, 1,350° and 1,400°C. The work is a further contribution to the more comprehensive scheme for examining the general behaviour of refractory materials in stress at high temperatures.

In addition to the work on the deformation of fireclay materials under compression at 1,250° to 1,400°C., experiments have proceeded on the deformation of porcelain and fireclay under torsion at 1,000°C. Under these conditions the deformation may be regarded as a complex of (i) elastic deformation which is instantaneous and immediately recovered on removing the stress, (ii) viscous-elastic deformation the rate of which decreases with time and which is recovered at a decreasing rate when the stress is removed, (iii) viscous deformation which is not recovered on removing the stress. Attention has been concentrated on the viscous-elastic portion of the deformation.

A review of the literature dealing with the various functions of refractories in gas-fire backs has been prepared.

Monolithic Furnace Linings

The chief deterrent to the more extended use of this type of material is perhaps the shrinkage which occurs on drying and firing. Comparatively small values were obtained with some of the original mixtures studied. It has now been found possible to control the firing shrinkage still further by incorporating small proportions of materials which expand on calcination.

Coke Quality*

Report of I.G.E. Committee of Enquiry—Part II

The Committee of Enquiry on Coke Quality, having completed and submitted to the Council of The Institution of Gas Engineers its Report (Part I) dealing with the Sizing of Coke,† has given consideration to the second part of its Report on the Properties of Coke. Such properties or factors as chemical and physical structure, reactivity, moisture content, and ash have been considered.

The Committee feels that immediate benefit to coke quality would accrue if the known advantages of good retort house control were followed much more generally than is the case at present—*e.g.*, such control would see that coke was not over-carbonized or over-quenched.

The problem of improving the combustibility of coke by (1) modification of carbonizing conditions; (2) selecting suitable coal when possible; (3) using coal de-dusted and cleaned down to the inherent ash; (4) blending of coal; (5) controlling moisture content; (6) chemical activation, obviously opens a very wide field, which the Committee strongly urges should be investigated at the earliest possible moment by the Gas Research Board or such other body to which the Gas Research Board might think fit to refer it.

It will be recalled that the Committee in Part I of its Report stated that it was of the opinion that for some time to come the policy of the Gas Industry will be to develop as a two-fuel Industry—namely, gas and coke. On this basis, therefore, it will be necessary to prepare gas coke for the domestic market for—

(*a*) The provision of a satisfactory carbonized fuel for use in open coal grates already installed in houses.

(*b*) The provision of a satisfactory smokeless solid fuel for post-war houses.

(a) *Solid Fuel for Domestic Purposes.*

There are some 12 million families in this country, of whom almost all have at least one solid fuel fire. There is evidence that approximately 40 million tons of coal are used annually for domestic purposes, plus about 7 million tons of coke. It is apparent that there is a considerable field of expansion for the domestic use of gas coke in place of coal.

A large proportion of this coal is burnt in kitchen ranges, for cooking and water heating. Coke can be and, in fact, is to-day burnt efficiently in many cases for this purpose in such appliances. The remainder is burnt either in old-fashioned types of bar grate or in the more modern barless grates, but in neither of these latter types of appliance is normal gas coke sufficiently free-burning to be capable of replacing coal entirely. The development of this application of gas coke is thus determined by the rate at which special coke grates can be installed in place of existing coal grates, or by the possibility of offering a more reactive coke sufficiently free-burning to replace coal in existing coal grates.

(b) *Smokeless Fuel for Post-War Houses.*

The use of smokeless fuel in post-war houses should be strongly advocated, and for this purpose the special coke-burning appliances burning suitably sized gas coke would be entirely satisfactory.

Coke should be regarded as a prepared fuel, requiring properly designed appliances, in the same way as other fuels—gas, electricity, oil, anthracite—require special equipment for their efficient use.

Any enforcement, by legislation, of the abolition of domestic smoke would involve an enormous expansion of the smokeless fuel industries. Such legislation might be made to apply, in the first place, to all new houses (case (*b*) above). The replacement of coal in existing open coal grates would necessarily be a gradual process. In any expansion of the Gas Industry to meet this increased demand for smokeless fuel it would be for economic policy to determine to what extent the demand should be met by (*a*) gas, (*b*) normal gas coke in special coke grates, (*c*) reactive and specially activated gas coke in existing grates. In order to be able to decide such policy the Gas Industry should collect as much information as possible concerning the technique and economics of the production of activated and other specially reactive coke.

There is still considerable room for improvement in the quality of gas coke, particularly as a domestic fuel.

Some improvement can be effected by producers themselves by careful quenching and sizing and, in times when any choice is possible, by a careful selection of suitable coals.

The Committee is of the opinion that more consideration should be given to the use of coal which has been cleaned down to the inherent ash and from which the dust has been removed.

Further investigation is necessary in order that reliable information may be obtained concerning the economics of processing such coals.

The physical advantages from the point of view of coke production cannot be in doubt.

Conclusions and Recommendations.

The Committee concludes from this review that:

1. The immediate short-term policy of the Gas Industry should be the installation of special coke-burning appliances to burn gas coke, both in post-war houses and in replacement of a proportion of existing open coal grates.
2. There is clearly need for further improvement in (i) the quality and preparation of gas coke and (ii) the design of coke-burning appliances. The Gas Industry should possess all necessary information concerning the methods and economics of producing coke of better quality. The information should include, for example, the question of activating the less reactive types of coke to an extent sufficient to render such cokes suitable for use in special coke grates or in existing open coal grates.
3. The collection of this information would involve a study of previous work, contact with bodies at present investigating the matter, and also original research within the Gas Industry itself. This work is clearly outside the scope of the Committee of Enquiry, and it is suggested that the Gas Research Board would be the appropriate body to undertake it.
4. After the war there is likely to be a considerable quantity of hard coke available for the domestic market, and the makers of hard coke are keenly interested in the possibilities of producing a suitable domestic coke. There should be closer co-ordination of research between the Gas Industry and the coke oven industry.

* **Inst. Gas Eng. Comm. No. 261.**

† *Inst. Gas Eng. Comm. No.* 252, (1942).

The Committee recommends that:

1. The National Federation of Gas Coke Associations be asked to develop its present policy for the improvement of gas coke for the market.
2. The appliance makers be encouraged to improve still further the design of special coke-burning appliances.
3. The Gas Research Board be requested (*a*) to obtain the necessary information concerning the methods and economics of producing cokes of better quality, including the question of activating the less reactive types, in order to render them suitable for use either in special coke grates or in existing open coal grates, and (*b*) to undertake any necessary research investigation involved.
4. There should be the closest co-ordination of research and collaboration between gas coke producers, the coke oven industry, and the Gas Research Board, in connexion with the production of free-burning coke for use in open domestic grates.

H. C. SMITH (*Chairman*), W. L. BOON, T. F. E. RHEAD, SAMUEL TAGG.

Production of Free-Burning Coke in Gas-Works at Normal Carbonizing Temperatures*

By G. M. GILL, M.Inst.C.E., M.I.Mech.E.,

Managing Director and Chief Engineer, Severn Valley Gas Corporation, Ltd.

(*Concluded from p. 659*)

VI. TYPE AND CHARACTERISTICS OF COKE MADE

Having described the types and properties of coals used, the method of blending, and the carbonizing results, it will now be advisable to give as much detailed information as possible regarding the class of coke made from the blends. All the tests in this respect were carried out by John Roberts, and are described in his own words:

RADIATION TESTS ON THE SPECIAL COKE.

Type of Radiometer Used.

The radiant efficiencies of the special free-burning high-temperature cokes from the blends are set out below, and for purposes of comparison there are also included tests on two well-known low-temperature fuels, and on an average quality of house coal. The special coke tests include (i) high-temperature coke made at the Lichfield Works from a blend (*a*) using its own cinders on the grate, and (*b*) without cinders; (ii) a series of three tests of coke made at the Cannock Works, using the same blended coals in intermittent vertical retorts. One test was carried out on the high-temperature Cannock coke from 100% coking coal, another on the high-temperature coke from a 50/50 blend, and a third on the high-temperature coke from 40% coking and 60% non-coking coal made in intermittent vertical retorts.

The radiant efficiencies of the fuels were determined under living-room conditions with the aid of the thermostat radiometer* designed by Roberts. It consists of a mercury thermostat mounted on a metal reflector attached to a carriage, and connected to a bell circuit. The carriage runs on a graduated runboard at right-angles to the fireplace. The intensity of the radiation is measured by the distance from the fire at which the mercury in the thermostat will rise to close the circuit and cause the bell to ring. It has been shown‡ that the results obtained with this radiometer are strictly comparable with those obtained under similar conditions with the Fuel Research Station radiometer, but in order to convert inches into Fuel Research Station units it is necessary to divide by ten.

The grate used was an ordinary 16-in. stool grate without front bars, but in this case fitted with a metal hurdle in order to provide sufficient depth of fuel bed—*i.e.*, about 10 in. The weight of the charge of fuel in nearly every case was 10 lb. 14 oz., this weight being chosen because in the preliminary tests it was found to be the maximum which could be laid in the grate when using a low-temperature smokeless fuel employed as a standard for comparison. In one instance, however, using pre-dried low-temperature fuel, exactly 11 lb. was used.

TESTS OF LOW-TEMPERATURE SMOKELESS FUELS.

No. 1 Low-temperature Fuel.

When comparing one's products with those of competitors it is generally advisable to give one's rival the fullest possible advantage. Therefore, the graph selected (fig. 2) as being representative of the behaviour and performance of a well-known low-temperature fuel is the best of three tests. The fuels were tested as they would normally be employed in households, using wood as kindling material, but in order to obviate the interference of charred paper, the wood was sprinkled with ½ oz. of paraffin. Solid fuels leave more or less cinders at the end of each day. These must be used up the next day, therefore the appropriate amount of cinders were used in every proper test. If only 1 lb. remained, that quantity would be used in starting up. If a coke left 2 or 3 lb., the quantity yielded in any one test was used in the succeeding test.

When using No. 1 low-temperature fuel the quantity of cinders remaining was only sufficient to cover the grate bars, about 1 lb. or so. Therefore, in the low-temperature fuel test in question, 1 lb. of cinders was placed on the bars, 12 oz. of wood sprinkled with ½ oz. of oil laid on the cinders, and 10 lb. of fresh fuel on top.

The graph shows that with the instrument placed at a distance of 5 in.

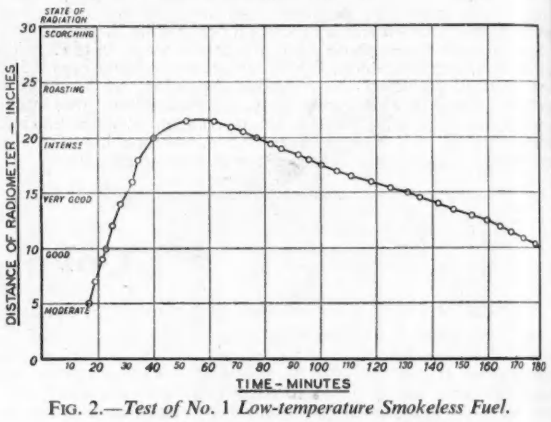

FIG. 2.—*Test of No. 1 Low-temperature Smokeless Fuel.*
Weight of Charge, 11 lb.; Fuel Consumed, 9 lb. 8 oz.

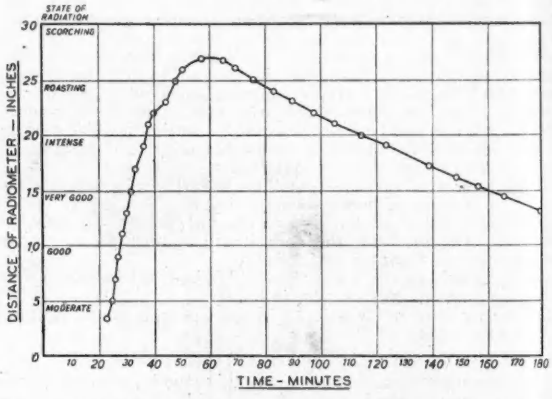

FIG. 3.—*Test of No. 2 Low-temperature Smokeless Fuel (from Notts Top Hard).*
Weight of Charge, 10 lb. 14 oz.; Fuel Consumed, 8 lb.

from the fire, contact was made at the end of 17 min, and a good fire was obtained in 23 min. The peak of radiation was reached after 52 min., and the fire began to decline after 62 min. at a steady rate until the end of the third hour. The fire was quenched immediately, and the residue weighed the following day. The fuel consumed amounted to 9½ lb. The performance of the fuel was regarded as quite satisfactory, and typical of this class of fuel.

No. 2 Low-temperature Fuel.

It would scarcely be sufficient to rely on only one low-temperature fuel; therefore another graph is submitted of a test carried out with a different commercial semi-coke made from Notts Top Hards. The weight of charge in this case was 10⅞ lb., including 2½ lb. of the previous day's cinders. Only 10 oz. of kindling wood was used in this test. The curve in fig. 3 shows that this fuel gave a better performance than No. 1. The amount of fuel consumed in the fixed period of 3 hr. was 8 lb. only.

* I.G.E. Publication No. 264.
† *Coal Carbonization*, January, February and March, 1939.
‡ *Ibid.*, February, 1939.

Test of Domestic Coal.

A test was also made with Notts Top Hard house coal, which gave the results shown in fig. 4. The radiation stage was reached rather later than with the low-temperature fuels, and although the peak was slightly higher than in the first case, the performance generally was not quite so good. The amount of kindling material used was 12 oz., and 9 lb. 9 oz. of coal was consumed. Thus it will be seen that 8 lb. of semi-coke gave better results than 9 lb. 9 oz. of the class of coal from which it was made. This is quite a normal experience, and to be expected from Margaret Fishenden's well-known experiments.

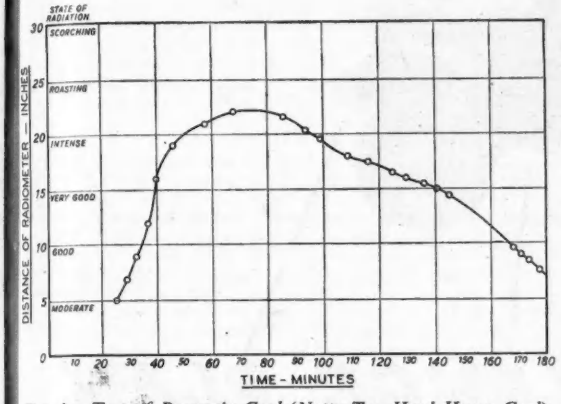

FIG. 4.—*Test of Domestic Coal (Notts Top Hard House Coal).*
Weight of Charge, 10 lb. 14 oz.; Fuel Consumed, 9 lb. 9 oz.

Tests with High-temperature Coke from Blended Coals.

The graph in fig. 5 show the result obtained when using the coke made from a 50/50 blend of coking and non-coking coal, carbonized at high temperatures in horizontal retorts as described in this Paper.

The test was carried out on October 26, 1938, 12 oz. of kindling material being used and 3 lb. of the previous day's cinders, with 7 lb. 14 oz. of fresh undried coke. The wood flames had expired at the end of 8 min., and ignition of the fuel appeared certain after 10 min. The first contact at $3\frac{1}{2}$ in. was made after 19 min. Good radiation was obtained in 23 min.; the "intense fire" stage was reached in 36 min., this being a splendid black-and-red fire; the "roasting fire" stage was reached in 52 min., while the high peak of radiation at 26 in. was attained at the end of 67 min. After that the fire declined very steadily during the remainder of the test period. The amount of fuel consumed was 8 lb. 3 oz.

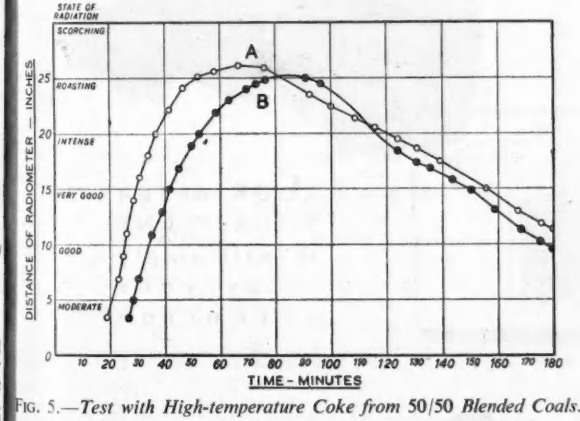

FIG. 5.—*Test with High-temperature Coke from 50/50 Blended Coals.*
Curve A—Weight of Charge, 10 lb. 14 oz.; Fuel Consumed, 8 lb. 3 oz.
Curve B—Weight of Charge, 10 lb. 14 oz.; Fuel Consumed, 7 lb. 15 oz.

On comparing this graph with those of the low-temperature fuels and coal, it is apparent that the special horizontal high-temperature coke is not only superior from the point of view of radiation, but it is also more economical in use than the first low-temperature fuel. The normal disadvantage of relatively high ignition temperature of the coke is overcome by the simple expedient of utilizing the previous day's cinders as explained above.

Curve B in fig. 5 shows the result obtained when using fresh coke only. The advantage of using the cinders left over from the previous day is very marked.

VII. INFLUENCE OF NON-COKING COAL

Coke which is manufactured from blends containing high-volatile non-coking coal is more reactive in the domestic grate than is coke made from "straight" coking coals. The improvement in radiation is shown in a striking manner in the graphs shown in figs. 6, 7, and 8. These cokes were made at high temperatures at the Cannock Works. The results shown in fig. 6 were obtained when using coke made from 100% of the particular coking coal used for blending with the non-coking slacks at these Gas-Works. The charge weighed $10\frac{7}{8}$ lb., of which 2 lb. 15 oz. were cinders, and 12 oz. of wood kindling was used. Although early ignition was noted, a decided lag set in after 20 min. The intense fire stage was not reached during the test. Only 7 lb. 6 oz. of fuel was consumed.

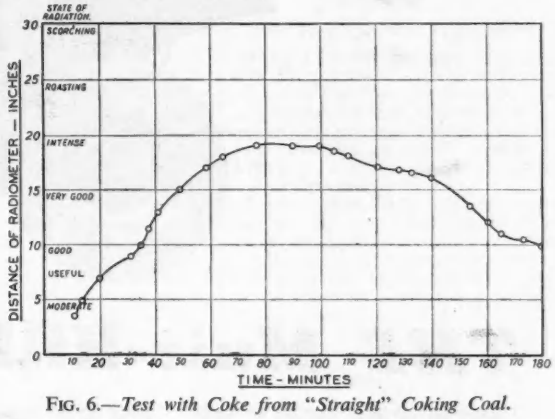

FIG. 6.—*Test with Coke from "Straight" Coking Coal.*
Weight of Charge, 10 lb. 14 oz.; Fuel Consumed, 7 lb. 6 oz.

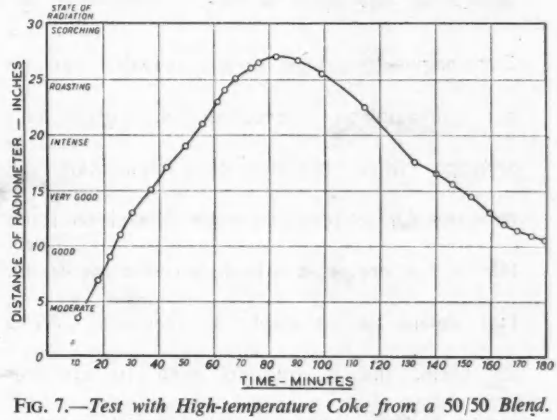

FIG. 7.—*Test with High-temperature Coke from a 50/50 Blend.*
Weight of Charge, 10 lb. 14 oz.; Fuel Consumed, 8 lb. 3 oz.

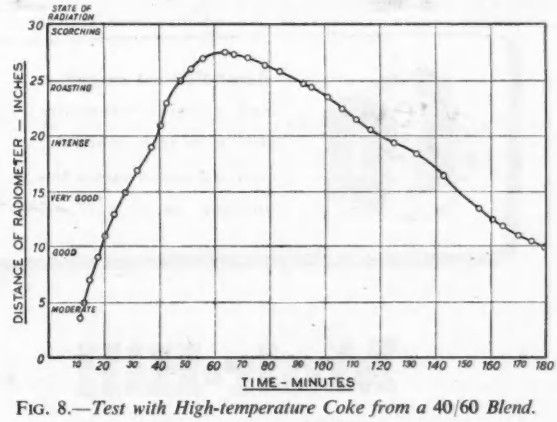

FIG. 8.—*Test with High-temperature Coke from a 40/60 Blend.*
Weight of Charge, 10 lb. 14 oz.; Fuel Consumed, 8 lb. 13 oz.

High-temperature coke from a 50/50 blend, using the same coking and non-coking coals as described in this Paper, was used in the test recorded in fig. 7. This reveals a definite improvement and a higher

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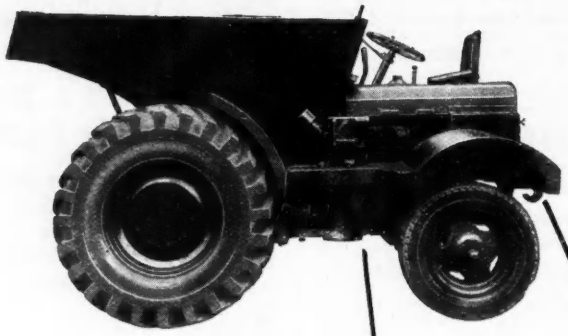

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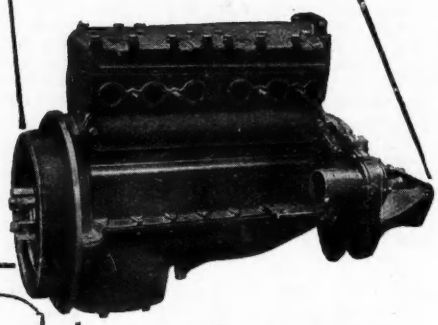

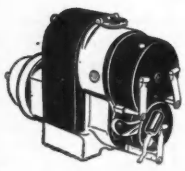

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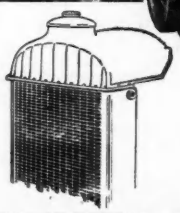

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peak. The weight of fuel consumed was 8 lb. 3 oz. In the succeeding test, coke was used in which the proportion of non-coking coal had been increased to 60%. A still further improvement is reflected in this curve, in that not only was a higher peak reached, but the various stages of radiation were attained earlier. The rate of combustion of the fuel had increased, as 8 lb. 13 oz. were consumed in the test.

The results as a whole showed, and these have been confirmed in several other trials with different cokes, that it is not essential to employ low temperatures in order to manufacture readily-ignitable, free-burning open-grate coke. This can be accomplished in the three types of carbonizing plant normally employed at Gas-Works and at high temperatures.

That the system can be successfully adopted in continuous vertical retorts was determined not only at the Cannock Works during 1936 to July, 1938, when 3,747 tons of non-coking slacks were used in an old installation of continuous vertical retorts, but this was also demonstrated earlier and on a large scale by A. B. Britton at the Hinckley Gas-Works in co-operation with John Roberts and the Author.

Gas Ignition Preferred.

Lest it be supposed that the Author prefers wood kindling to gas ignition it should be stated that the tests carried out by Roberts were made to demonstrate that these cokes could be used in ordinary common coal-using grates, and with the old-fashioned method of kindling. Still better results can be obtained when using gas ignition. The quantity required for ordinary horizontal coke is 11 cu.ft. of 500 B.Th.U. gas, when using a double-prong poker. The newer method of lighting fires by gas is cheaper than the old, requires less preparation and is more reliable. The advantage of gas ignition is brought out in fig. 9, and relates to tests carried out on coal.

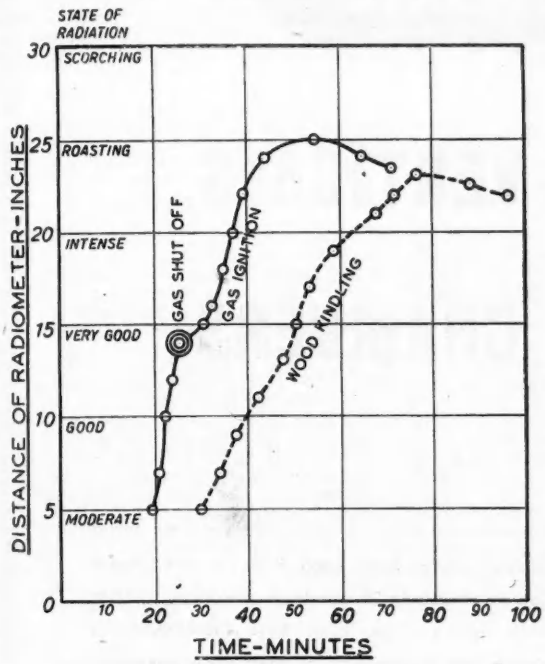

Fig. 9.—*Results of Gas Ignition Tests on Coal.*

Proportion of Non-Coking Coal used.

At Lichfield it was almost invariably the rule to blend the two coals 50/50, mainly due to its simplicity and having regard to the fact that no blending plant was installed, nor were there convenient facilities for installing such a plant. Moreover, the shovel blending was so unexpectedly successful. While two parts of coking and one of non-coking coal were used from time to time, it became apparent that this was difficult with shovels, and in practice the resultant coke seemed no better. Probably in this case there were apt to be pockets of non-coking coal which passed into the retorts without proper admixture with an appropriate quantity of coking coal. At Cannock and Tamworth, where the same non-coking slack was used in quantity, blending plants were installed, by the use of which blending could be carried out in any desired proportions.

At the Cannock Works 7,108 tons of non-coking slacks of two varieties were used, or 18% of all the coal carbonized during the period 1936–39 inclusive, all of which was blended mechanically with the same gas coal of nut or bean size as used very largely at the Lichfield Works. Prior to July, 1938, non-coking coal to the amount of 3,747 tons was used in continuous vertical retorts, while 3,361 tons were later used with better results in new intermittent vertical ovens. In the latter type of oven it was found practicable to use a blend of 40% of coking and 60% of non-coking coal, and yet make a coke with excellent free-burning properties and strong enough for handling. Incidentally, intermittent vertical ovens are particularly well suited to carbonizing blends of this type.

At Tamworth, with similar objects in view, 7,078 tons of non-coking slacks have been carbonized as a blend with suitable gas coals during the years 1936 to 1940 inclusive. This is equivalent to 19% of all the coal carbonized during that period.

Free Selection of Coal Essential for Blending.

To carry out a policy of making a free-burning coke under normal high-temperature conditions for the open grate, and with equal properties in this respect as low-temperature fuel, it will of course be realized by practical men that the Gas Undertaking must have a free choice of coal, of which there are many suitable varieties in several coal-fields. In fact, to make a success of any blending proposition, whether it be of coal or tea, the one all-important essential is complete freedom of selection of the raw material in the desired quantities.

The Severn Valley and Gas Consolidation Group had every intention of making a special type of free-burning coke at these three Works and at other Works also and of marketing it under a suitable trade name, but their efforts were frustrated through the changed conditions following on the operation of the Coal Mines Act, 1930, whereby their skilled knowledge of the best and most suitable coals to buy was nullified, to the disadvantage of the Gas Companies they control and of the gas consumers supplied.

VIII. THE FUTURE

It will not be out of place to state that the collieries supplying the non-coking coals showed no interest in this new use of their coal, nor did they at any time visit the Works to see how gas and coke were made from their coal. This was a disappointment to the Author, and a surprise also, having in mind the keen interest the Gas Industry always takes in any new development in the use of gas.

However, the Author claims that a good piece of work was done and that two blades of grass were made to grow where one grew before. He would welcome the opportunity of continuing this work, provided that no hampering restrictions were placed upon the selection and purchase of the coal. Whether this will or will not be practicable depends almost wholly, it would seem, upon the policy to be followed by the Ministry of Fuel and Power. Is that policy to be an enlightened one, as is so sincerely hoped, or is a dead hand to be placed, as in the past, on scientific progress and the full development of the country's coal resources?

The Author wishes to acknowledge the assistance rendered by Mr. F. G. Mantle, at that time Manager of the Lichfield Company, and the keen interest and skill displayed by Mr. J. G. Everett, the carbonizing specialist employed by the Group, and also by Mr. C. R. Ingham, then Engineer and Manager of the Cannock Company, who did some notable work in the blending of coals. Acknowledgment is also made to Mr. L. N. Burtonshaw, Engineer and General Manager of the Tamworth Company, who has also played an important part in this development. Credit is also due to Mr. O. H. W. Boonham, now Chief Chemist to the Group, but who, throughout the years in question, was travelling chemist of the Gas Consolidation Group of Companies and in close touch with the three Works concerned, and was responsible for many of the chemical and other tests made.

The Illuminating Engineering Society is publishing a series of "Lighting Reconstruction Pamphlets," the first three of which have now been issued. Illustrated by thumbnail sketches, these pamphlets state in simple terms the essentials of good lighting. They should prove of service to Government Departments, local authorities, borough engineers, architects, and others whose task it is to prepare for the vast lighting problems which will confront us during the period of post-war reconstruction. The pamphlets already issued deal respectively with "Principles of Good Lighting," "The Lighting of Public Buildings," and "The Lighting of Schools." Others are in preparation. (All these pamphlets are obtainable at a uniform price of 1s. each, 9s. a dozen, or £3 a hundred.)

During the Recent "Salute the Soldier" week at Cambridge, the University and Town Gas Light Company aimed at raising the sum of £1,000 as its contribution towards the Borough target of a million pounds. Not only was this ambition realized, but an additional amount of £297 was received at the Selling Centre which was the principal feature of the display at the head showrooms. A panoramic window display depicted a soldier being acclaimed as he left behind the ruins of the battlefield, while the interior ground space was devoted to an exhibition of official photographs. The Mayor (Ald. W. L. Briggs) officially recognized the patriotic efforts of the Gas Company when he visited the showrooms and was received by the Chairman (Mr. J. F. Cameron) and other Directors of the Company, together with the General Manager and Secretary (Mr. J. Hunter Rioch).

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Benzole Recovery by Activated Carbon

(*Continued from p. 666*)

Dr. M. **Barash** said the Government at the present time was endeavouring to have as much benzole produced as possible, and therefore he could not help feeling a glow of satisfaction when he listened to the figures which had been mentioned of 3.5 to 3.8 gallons of benzole to the ton of coal. It made him feel that the work upon which he was engaged was well worth while, even if the excellent results had only been acheived in isolated cases, where the engineers had been able to install the most modern plants as against those which were in use pre-war—plants which were themselves quite sufficient when designed for naphthalene removal and partial stripping, though they could not produce results equal to those shown by plant which was specially designed for maximum stripping.

In response to Mr. Ormrod's request, he welcomed the opportunity of commenting upon the influence of benzole recovery on gas output per retort at various C.V's.—information gained from long experience in his former associations. When Manchester and Southport were making 450 gas prior to stripping, presumably they were obtaining optimum yields per retort at 450. When it became necessary to increase the C.V. to 475 or 480 for stripping down to 450 the retort throughput (of coal) had to be increased correspondingly to give the optimum output at the higher C.V., but this did not mean that this higher throughput of coal could be achieved at 450. Increasing the throughput of coal, accompanied by reduced rate of steaming, necessarily resulted in a reduction of make per ton, but not necessarily (if optimum conditions were maintained) in a reduction of output per retort. To this reduced make per ton had then to be added a further reduction due to the benzole therms afterwards extracted, but the resulting reduction in output per retort was very small or negligible compared with the total reduction in make per ton. This has been confirmed in numerous instances, and particularly where, as was very often the case, the retorts had not been worked to the maximum capacity at the lower C.V. prior to the installation of benzole plants.

Mr. Ormrod had referred to the loss of adsorptive time in the cycle. Each adsorber of the pair took the whole of the gas with which the benzole plant had to deal, and it did not matter if the other was being by-passed during steaming; the whole of the gas was still being stripped in the alternate adsorber, and thus for the whole of the period of each cycle.

An interesting point was also raised in regard to H_2S. It was known, from the work done by the South Metropolitan Gas Company, who introduced a method for catalytically removing carbon bisulphide from gas, that carbon bisulphide and steam reacted when passed over a metal catalyst. The carbon bisulphide might be 100% converted into H_2S, which was then removed by purifiers. There was no doubt that if there were conditions in the adsorber such that catalytic action would occur, the result would be a certain amount of conversion of carbon bisulphide into H_2S. Investigations had shown that with activated carbon plants, where steam pipes were embedded in the carbon mass, there were indications of catalytic action by the iron, resulting in traces of H_2S in the outlet gas. Mr. Lewis's suggestion in regard to enamel painting of all internal metallic surfaces was therefore particularly interesting as a method of avoiding possible catalytic conversion of carbon bisulphide by metal.

He had had the opportunity of inspecting practically benzole recovery plant of this type in the country, and there was no doubt that they had their right and proper place in the future of the Gas Industry. Even the coke oven people were beginning to think seriously of installing activated carbon plants, but their difficulty was that they were dealing with unpurified gas. Some of them, however, were even considering installing purifiers so that they could put the activated carbon plant beyond the purifying plant.

Mr. **J. Albinson** (Manchester) said the question of costs was very important. The publication of operating costs such as had been indicated in the Paper might create an entirely wrong impression, where it might do the Industry much harm. He was not, of course, referring to the members of a technical audience. Undoubtedly the operational costs were low, but if the whole of the costs was indicated, the picture would not appear to be so rosy. One good reason for the use of activated carbon was that it could be home-produced.

Mr. **T. Nicklin** (Stretford) said comparison of the results obtained with activated carbon and with wash-oil plants showed that the wash-oil plant had advantages in nearly every respect. In order to indicate the manner in which he arrived at this decision he compared activated carbon with a modern wash-oil plant incorporating vacuum distillation, with which he was in daily contact and to which the operating cost figures referred.

To what extent did the presence of oil in an oil-washing plant increase the danger of fire? With benzole vapour of very low flash-point around in each method of recovery it would appear that this factor determined the extent of the danger of fire, wash-oil having a very much higher flash-point than benzole, being 300°F. open flash-point Pensky Martin as against the benzole figure of below 90°F. Abel. From the foregoing it seemed that the extent of the fire danger was present to an equal extent in either method of recovery. The question of cleanliness depended to a great extent on plant construction, and whereas it was agreed that carbon plants did not entail the possibility of oil leaks, a well-designed oil-washing plant with flanges of 8 bolts as opposed to the normal 4 bolts did not suffer any disadvantage from dirt occasioned by oil leakage, and in point of fact, from personal experience on a modern vacuum distillation oil-washing plant, he doubted whether a much cleaner plant in operation could be found.

The question of home-produced recovery media as opposed to imported recovery media was of importance, especially in wartime, but here again after four and a half years of war no difficulty has been experienced in obtaining wash-oil supplies of constant quality. Furthermore, it was not correct to assume that wash-oil plants operated on imported media, whereas, although a large number of plants did operate on mineral hydrocarbon oil, there were a large number of plants operating on home-produced creosote oil, and if ever the need did arise, mineral oil could be replaced by creosote oil.

He would like to compare operating results of the two processes, since, although they had heard figures of 3.5 to 3.7 gallons per ton recovery with 50–60% organic sulphur removal, these figures had been given by vertical retort people. Owing to the method of carbonizing, the benzole recovered from vertical retorts contained a high proportion of paraffins, up to 25%; the benzole available in the gas from vertical retorts was around 4.2 gallons per ton of coal carbonized, as indicated by the figures given in the Paper and by the results given for Southport and Buxton. On the basis of 4.2 gallons per ton available in the gas and a recovery of 3.5 to 3.7 gallons per ton, there was a recovery efficiency of 83.5% to 88% throughout the whole life of the carbon, and this overall efficiency was the figure to be taken, not that of 99% plus efficiency with new carbon at the beginning of its adsorbing life. Figures given by Atherton (horizontals) showed a recovery of 3.2 gallons falling to 2.8 gallons per ton, with an average recovery of 3.1 gallons per ton throughout the carbon life. If the benzole available in the gas was taken as equal to 3.6 gallons per ton in the case of horizontal retorts, these figures represent an overall efficiency of 86%.

He then gave details of the recovery on a modern vacuum distillation oil-washing plant (horizontal retorts). The benzole content of the gas was 3.6 gallons per ton, and the benzole recovered over an extended period of 18 months, taking into account reduced make due to shortage of gas, &c., was 3.1 to 3.2 gallons per ton. This represented an overall recovery of 86% to 89%. Furthermore, this recovery was constant from day to day, month to month, and year to year, and was not subject to falling-off in efficiency due to fouling of carbon as was the case in the carbon plant.

The following figures gave the operating results during the past 18 months:

Oil flow	11–12 gallons per 1,000 cu.ft. gas.
Washing temperature	60°F.
Total steam per gallon benzole ...	25 lb.
Cooling water per gallon benzole ...	60 gallons.
Total steam per gallon of oil	0.585 lb.
Organic sulphur removal	50–55%.
Quality of Benzole.	
Sp. gr. at 60°F.	0.880.
8 Pear distillation: 100°C.	81%.
160°C.	96%.
Total sulphur	1.2–1.4% wt./wt.

The great saving in steam effected by vacuum distillation was accomplished by the use of vapour/oil and oil/oil heat exchangers and by the use of exhaust steam on the final oil heater. Benzolized oil leaving the heat exchange system at 64°C. was pre-heated in the exhaust steam pre-heater to 89°C. before entering the still. The still was maintained under a vacuum of 20–22 in. Hg gauge by means of a reciprocating wet vacuum pump. Exhaust steam from oil circulating pumps, vacuum pump, and washer circulating pump engine was fed into a common exhaust main, this exhaust steam being almost sufficient for the pre-heater and open steam to still. The figure of 25 lb. of steam per gallon of benzole represented the total steam used on the plant for all purposes, and the figure for water likewise included benzole condenser, naphtha cooler, and oil coolers. Naphtha was mixed with the benzole, and the figures given for quality of benzole were tests taken on benzole and naphtha and not benzole alone, both benzole and naphtha being mixed at the inlet to the vacuum pump and transferred to the same storage tank.

It might also be mentioned that the lower distillation temperature 85°–90°C. due to vacuum and the use of special absorption oil had resulted in freedom from any form of sludge trouble.

As regards flexibility, from the point of view of reduced recovery at periods when gas demands necessitated such reduction in recovery oil-washing plants could be readily adjusted to meet any conditions, with total naphthalene removal on all the gas (no by-pass necessary), whereas in the case of carbon a reduction in recovery at the time when all the gas was passing through the treater would result in a reduction in carbon life. It had been mentioned in the Paper that an oil washer with, presumably, oil regeneration, was to be used to effect naphthalene removal at such times as it was inconvenient to run the carbon plant. Such a method of naphthalene removal was not necessary in the case of oil-washing, and furthermore the capital charges of a naphthalene washer and oil regeneration plant working at such times as the carbon plant was down would stand as a constant charge against benzole removal by activated carbon, and would of necessity result in an increase in the cost of production per gallon of benzole recovered.

(*To be concluded*)